REMARKS

Favorable reconsideration of this application in light of the following comments is respectfully requested.

Claims 5, 8, 10, 11 and 15 are presently active in this case, Claims 1-4, 6, 7, 9 and 12-14 having been withdrawn from consideration as directed to a non-elected invention.

In the outstanding Office Action, Claims 5 and 11 were rejected under 35 U.S.C. § 103 as being unpatentable over Tanaka et al. (U.S. Patent 6,044,128, hereinafter called "Tanaka") in view of Date et al. (U.S. Patent 5,973,558, hereinafter called "Date"). Claims 8 and 15 were rejected under 35 U.S.C. § 103 as being unpatentable over Tanaka in view of Date and further in view of Kamimura (U.S. Patent 6,081,015). Claim 10 was rejected under 35 U.S.C. § 103 as being unpatentable over Tanaka in view of Date and Kaifu (U.S. Patent 6,448,561).

Applicants respectfully traverse the outstanding grounds for rejection, because in Applicants' view the claimed invention patentably distinguishes over the applied prior art as discussed hereinafter.

Briefly recapitulating, as described in pages 4-6 of Applicants' specification, Applicants' invention addresses the problem in imaging devices in which very faint signals are to be detected in order to obtain a large dynamic range, but in which the ability to detect such faint signals is compromised by variation of the threshold voltage V_{th} of the switching transistors through which the faint voltages are output. To prevent variation of the threshold voltage V_{th}, according to the exemplary embodiment shown in Figure 6 of Applicants' disclosure, there is provided a bias potential through a protection diode 50, and is shown in Figure 7, corrective voltage pulses V_c, V_c(BLK) in the range between the specified voltage and about 0 volts are applied immediately after reading the pixel potential or at a blanking

period T_2 to prevent the threshold voltage V_{th} of the output transistor 20 from being increased. Accordingly, as stated in pending Claim 5, the X-ray imaging device comprises "a correction control circuit for supplying a gate voltage with a polarity opposite to the gate voltage pulse to at least a part of the gate electrodes of the thin film transistors ... and the correction control circuit supplies the gate electrode with the gate voltage having a polarity or a direction that makes the mean value of the driver gate pulses at operating period zero or reduced, during non-image reading period of the X-ray imaging device."

Thus, in the claimed X-ray imaging device, a deterioration in the signal to noise ratio which would otherwise occur because of a variation of the threshold voltage of the output switching transistor is ameliorated during the output of the faint signal from a pixel signal sensor of the imaging device. In Applicants' view, this structure and functionality is quite different from a display such as an LCD which inputs and displays a large signal from a driver.

Reiterating, the invention recited in Claim 5 is directed to an X-ray imaging device including a correction control circuit which applies to either a pixel switching TFT or another TFT connected to the pixel switching TFT, or both, a drive gate pulse having a certain polarity during a non-image reading period, so as to eliminate or reduce variations in the threshold voltage level VCTH of the pixel switching TFT or other transistor.

Tanaka discloses an X-ray imaging apparatus that includes total charge conversion devices for converting irradiated X-rays into electric charge and corresponding plural charge storage devices for storing the converted electric charge. Each charge conversion device and charge storage device represents a pixel in an image and is read by a thin film transistor. A thin film diode is connected to each charge storage device to discharge excessive stored voltage (see the Abstract). Thus, as shown in Figure 2A of Tanaka, a MIM structure 9 is

connected between each TFT and a bias line 17. However, as acknowledged at page 4, lines 9-15 of the outstanding Office Action, Tanaka does not explicitly show detail about the correction control circuit for supplying a gate voltage with a polarity opposite to the gate voltage pulse etc. as stated in the last two paragraphs of Claim 5. In fact, Tanaka does not recognize a problem in shift of the threshold voltage of the switching transistor, and includes no teachings by which this shift in threshold voltage can be eliminated or reduced.

Date discloses a differential amplifying apparatus integrated into liquid crystal driver for driving a TFT matrix color liquid crystal panel, as described at column 1, lines 4-8. In other words, the differential amplifier disclosed by Date is a driver circuit for driving a TFT voltage in a signal to a TFT switch for displaying a pixel in an LCD panel. The Date differential amplifier is used for a capacitive D/A converter for converting a digital color image signal to an analog voltage. In other words, the Date differential amplifier is part of a driver circuit which supplies a voltage and a signal to a TFT switch for a display pixel in the LCD panel.

Date discloses that a parasitic capacitance exists on an input of the differential amplifier and affects an output V_o. Date teaches to remove the influence of the parasitic capacitance to stabilize the output V_o, as suggested at column 4, lines 52-61 of the Date patent.

However, Applicants point out that the circuit disclosed by Date is the driver itself which supplies power to the pixel for a LCD panel. It is not an output circuit for extracting a faint signal produced in a pixel signal sensor, as is Applicants' invention. Thus it is seen that the pixel in question in the Date patent receives a signal for displaying, contrary to the pixel sensor of Applicants' invention which is a source of, and generates, an imaging signal. It is Applicants' view that such a driver as taught by Date is not relevant to generation of minute

faint signals from a pixel signal sensor, and furthermore, in that context, it is not reasonable to glean any teachings concerning variation of the threshold voltage V_{th} of a TFT which outputs the faint signal from a pixel signal sensor. Therefore, it is respectfully submitted that, absent hindsight, there is clearly no motivation to combine teachings from Date which involves a signal driver to Tanaka which involves a signal generator where neither of these references is at all remotely concerned with the same problem, i.e., eliminating or reducing threshold voltage V_{th} in a pixel sensor TFT. So further, neither reference appears to include teachings which would suggest generation of the signal V_c, V_c(BLNK) as shown in Applicants' Figure 7. For these reasons, it is respectfully submitted that the combined teachings of Tanaka and Date, when considered in the absence of hindsight, in no way obviate the claimed invention.

The remaining cited references have also been considered, but are deemed no more pertinent to the question of patentability than the Tanaka and Date patents above discussed. Indeed, Kamimura merely describes application of a lower limiting voltage to a protection diode, and Kaifu merely discloses a control circuit 4 connected to SW1 and SW2 for controlling irradiation of an X-ray tube. By irradiation, as shown in Figure 10 or Kaifu, STAND-BY MODE and EXPOSURE MODE are operated. However, neither Kamimura nor Kaifu include any teachings concerning variation of the threshold voltage of the sensors switching transistor and neither of these references cure the deficiencies of the Tanaka and Date references above discussed. Accordingly, it is respectfully submitted that the active claims under rejection patentably define over the cited art and that the outstanding grounds for rejection are traversed.

Consequently, in view of the above comments, it is respectfully submitted that elected Claims 5, 8, 10, 11 and 15 patentably define over the cited art and are in condition for allowance. An early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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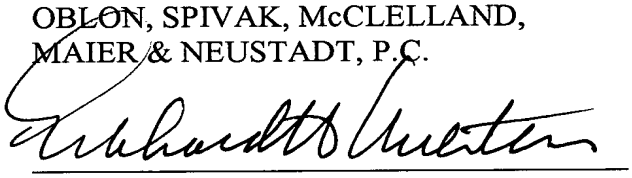

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